2015 Human Biology

Higher

Finalised Marking Instructions

Part One: General Marking Principles for Human Biology Higher

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

(a) Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you are uncertain how to assess it, you must seek guidance from your Team Leader/Principal Assessor.

(b) Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

GENERAL MARKING ADVICE Human Biology Higher

The marking schemes are written to assist in determining the "minimal acceptable answer" rather than listing every possible correct and incorrect answer. The following notes are offered to support Markers in making judgements on candidates' evidence, and apply to marking both end of unit assessments and course assessments.

1. There are no **half marks**. Where three answers are needed for two marks, normally one or two correct answers gain one mark.

2. In the mark scheme, if a word is **underlined** then it is essential; if a word is (**bracketed**) then it is not essential.

3. In the mark scheme, words separated by/are **alternatives**.

4. There are occasions where the second answer negates the first and no marks are given. There is no hard and fast rule here, and professional judgement must be applied. Good marking schemes should cover these eventualities.

5. Where questions on data are in two parts, if the second part of the question is correct in relation to an incorrect answer given in the first part, then the mark can often be given. The general rule is that candidates should not be penalised repeatedly.

6. If a numerical answer is required and units are not given in the stem of the question or in the answer space, candidates must supply the units to gain the mark. If units are required on more than one occasion, candidates should not be penalised repeatedly.

7. Clear indication of understanding is what is required, so:

- if a description or explanation is asked for, a one word answer is not acceptable
- if the questions ask for **letters** and the candidate gives words and they are correct, then give the mark
- if the question asks for a word to be **underlined** and the candidate circles the word, then give the mark
- if the result of a calculation is in the space provided and not entered into a table and is clearly the answer, then give the mark
- **chemical formulae** are acceptable eg CO_2, H_2O
- contractions used in the Arrangements document eg DNA, ATP are acceptable
- words not required in the syllabus can still be given credit if used appropriately eg metaphase of meiosis.

8. Incorrect **spelling** is given. Sound out the word(s),

- if the correct item is recognisable then give the mark
- if the word can easily be confused with another biological term then **do not** give the mark eg ureter and urethra
- if the word is a mixture of other biological words then **do not** give the mark, eg mellum, melebrum, amniosynthesis.

9. Presentation of Data:

- if a candidate provides two graphs or bar charts (eg one in the question and another at the end of the booklet), mark both and give the higher score
- if the question asks for a line graph and a histogram or bar chart is given, then do not give the mark(s). Credit can be given for labelling the axes correctly, plotting the points, joining the points either with straight lines or curves (best fit is rarely used)
- if the *x* and *y* data are transposed, then do not give the mark
- if the graph used less than 50% of the axes, then do not give the mark
- if 0 is plotted when no data is given, then do not give the mark (ie candidates should only plot the data given)
- no distinction is made between bar charts and histograms for marking purposes. (For information: bar charts should be used to show discontinuous features, have descriptions on the *x* axis and have separate columns; histograms should be used to show continuous features; have ranges of numbers on the *x* axis and have contiguous columns.)
- where data is read off a graph it is often good practice to allow for acceptable minor error. An answer may be given $7{\cdot}3 \pm 0{\cdot}1$.

10. Extended response questions: if a candidate gives two answers where there is a choice, mark both and give the higher score.

11. Annotating scripts:

- put a 0 in the box if no marks awarded – a mark is required in each box
- indicate on the scripts why marks were given for part of a question worth 3 or 2 marks. A tick near answers will do.

12. Totalling scripts: errors in totalling can be more significant than errors in marking:

- enter a total mark for each double page on the bottom corner of the right hand page.
- add up these double page totals, at least twice, to get an overall total mark.
- enter this checked total on the front page of the candidate's script.

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Part Two: Marking Instructions for each Question

Section A

Question	Expected Answer(s)	Max Mark
1.	C	**1**
2.	D	**1**
3.	B	**1**
4.	A	**1**
5.	A	**1**
6.	C	**1**
7.	B	**1**
8.	C	**1**
9.	A	**1**
10.	A	**1**
11.	A	**1**
12.	C	**1**
13.	A	**1**
14.	D	**1**
15.	D	**1**

Question	Expected Answer(s)	Max Mark
16.	A	**1**
17.	D	**1**
18.	B	**1**
19.	C	**1**
20.	A	**1**
21.	D	**1**
22.	D	**1**
23.	D	**1**
24.	B	**1**
25.	A	**1**
26.	B	**1**
27.	C	**1**
28.	B	**1**
29	C	**1**
30.	B	**1**

Section B

Question			Expected Answer(s)	Max Mark	Additional Guidance
1	**(a)**	**(i)**	Hydrogen	**1**	
1	**(a)**	**(ii)**	Y – deoxyribose Z – phosphate	**1**	
1	**(a)**	**(iii)**	ATP <u>and</u> enzymes/(DNA) polymerase	**1**	Accept helicase.
1	**(b)**		Ensures new cells have the same chromosomes/DNA/genes/<u>genetic</u> information/are <u>genetically</u> identical/have a complete copy of the genome. **Or** To maintain the correct quantity/number complement of DNA/chromosomes.	**1**	Not – so cells contain the correct DNA.
2	**(a)**		Inborn error of metabolism	**1**	Not mutation Not metabolic disorder
2	**(b)**	**(i)**	It will contain a different order / number of nucleotides / bases.	**1**	Accept a specific <u>description</u> of a gene mutation eg insertion of a base.
2	**(b)**	**(ii)**	The <u>protein/enzyme</u> produced contains a different order/number of amino acids.	**1**	Not – It contains different amino acids.
2	**(c)**		Glucose is used up in respiration/to provide energy/ATP <u>and</u> they have no/less glycogen/stores to provide more glucose.	**1**	
2	**(d)**		Recessive – Disease skips generations **Or** Two unaffected parents can have an affected child. **1 mark** Sex-linked – More males will be affected than females **Or** Affected males do not pass the condition to their sons. **Or** Affected females pass the condition to their sons. **1 mark**	**2**	Not heterozygous parents. Not – only males are affected.

Question			Expected Answer(s)	Max Mark	Additional Guidance
3	(a)		Line goes down from left to right and crosses X axis at 0·85.	1	Line can be drawn at any angle. Accept 0·84 to 0·86
3	(b)		To allow (time) osmosis/water movement to occur.	1	Accept diffusion in place of osmosis.
3	(c)		Osmosis does not require energy/ATP while active transport does. **Or** Osmosis involves the movement of water while active transport involves the movement of other (small) molecules. **Or** Osmosis involves movement from high to low concentration while active transport involves movement from low to high concentration. **Or** Active transport involves carrier proteins, osmosis does not.	1	Accept osmosis is a passive process while active transport requires energy. Accept down the concentration gradient, but not along the gradient.
3	(d)		ADH makes tubules/collecting duct more permeable **Or** ADH increases the permeability of the tubules/collecting duct. **1 mark** More water is (re)absorbed (into the blood) so blood/plasma salt concentration decreases. **1 mark**	2	If candidate has described less ADH in part 1 then award correct description of effect here.
4	(a)		The ability to reproduce.	1	Not replicate/contain nucleic acid.
4	(b)		(RNA is destroyed) so the virus cannot reproduce/replicate. **1 mark** (Protein coat left intact) so that the antigens remain. **1 mark**	2	
4	(c)		1. Ribosomes – where the protein coat/ enzymes of the virus are produced. **1 mark** 2. Mitochondria – provide energy/ATP for RNA/DNA replication/protein synthesis. **1 mark**	2	Not where viral proteins are made. Accept nucleic acid for RNA /DNA.

Question			Expected Answer(s)	Max Mark	Additional Guidance
5	**(a)**		• Volume/mass of yeast/suspension. • Concentration of yeast suspension/ solution/number of yeast cells. • Type/age/source of yeast cells. • Area/size/diameter/volume/thickness/ type of gel or dish. • Concentration of nutrients in gel/pH of gel. • Strength or intensity of lamp/use same lamp/distance of lamp. • Temperature of incubator. • Time for yeast to grow/dishes left in incubator. **Any 2**	**2**	Do not accept amount but do not penalise twice if used in both answers.
5	**(b)**	**(i)**	Correct scales and labels on axes. **1 mark** Points correctly plotted and line drawn. **1 mark**	**2**	Remove 1 mark if less than half the graph paper is used. Transposed axes - remove 1 mark
5	**(b)**	**(ii)**	Increasing the exposure (to UV radiation) increases the number of yeast cells/ colonies that die/are damaged.	**1**	Answer must not refer to the number of yeast cells growing.
5	**(b)**	**(iii)**	Repeat the investigation at each exposure (time). **Or** Repeat the investigation and calculate an average/averages.	**1**	
5	**(c)**	**(i)**	400	**1**	
5	**(c)**	**(ii)**	The number of yeast cells/colonies surviving at SPF 15 is much more than with no sunscreen/at SPF 6 and almost as much as with higher SPF values.	**1**	
5	**(c)**	**(iii)**	350 minutes/5 hours 50 minutes.	**1**	Units are essential.

Question			Expected Answer(s)	Max Mark	Additional Guidance
6	**(a)**	**(i)**	Seminiferous tubule.	**1**	Phonetic – semiferous no semenifyrus yes
6	**(a)**	**(ii)**	It releases/produces FSH. **1 mark** It releases LH/ICSH which causes interstitial cells to produce testosterone. **1 mark**	**2**	
6	**(b)**	**(i)**	Meiosis.	**1**	
6	**(b)**	**(ii)**	1. X chromosome – 2/half of them/50%. 2. Autosomes – 4/all of them/100%.	**1**	
6	**(c)**		1	**1**	
6	**(d)**	**(i)**	1	**1**	
6	**(d)**	**(ii)**	Sperm obtained from donor. **Or** Concentrated sperm sample collected. **1 mark** Sperm then introduced into female reproductive tract/vagina/uterus/oviduct (by tube/syringe). **1 mark**	**2**	Accept - Multiple sperm samples are collected

Question			Expected Answer(s)	Max Mark	Additional Guidance
7	(a)	(i)	Q − Pulmonary vein. Carries blood to the left atrium/left side of the heart. **Or** Carries blood from the lungs.	1	Not carries blood to the heart. Deoxygenated blood negates.
7	(b)	(i)	Carotid artery.	1	
7	(b)	(ii)	P has a thicker (muscular) wall. **Or** P does not contain valves while R does. **Or** P has a smaller/narrower lumen.	1	Accept reverse. Accept Q if given in place of R. Not narrower diameter.
7	(c)		1. Carbon dioxide is diffusing/moving into the air sacs/lungs. **1 mark** 2. Carbon dioxide is produced by respiration (in brain cells). **Or** Carbon dioxide diffuses/moves into the blood. **1 mark**	2	Diffusion can be discussed in terms of concentration gradient.
7	(d)		Name – tricuspid/AV/atrioventricular Function – Prevents backflow of blood into the (right) atrium/from the (right) ventricle. **Or** Ensures blood flows into the pulmonary artery.	1	

Question			Expected Answer(s)	Max Mark	Additional Guidance
8	**(a)**		Between work levels 1 to 5 the stroke volume increased and then it remained constant between levels 5 and 7. **1 mark** It increased from 88 cm^3 to 140 cm^3. **Or** It remained constant at 140 cm^3. **1 mark**	**2**	Accept stroke volumes increase up to work level 5 and then level out.
8	**(b)**		102	**1**	
8	**(c)**		19 600	**1**	
8	**(d)**	**(i)**	4·5	**1**	
8	**(d)**	**(ii)**	120 beats/min	**1**	Units essential. bpm is acceptable.
9	**(a)**		Hypothalamus	**1**	Hypothalmus is acceptable.
9	**(b)**		It constricts/narrows/vasoconstriction occurs so there is decreased blood flow to the skin/ surface **or** blood flows further from the surface.	**1**	Accept blood flow to the skin stops instead of decreases.
9	**(c)**		Hairs stand up, trapping air which provides insulation.	**1**	
9	**(d)**		Evaporation of sweat/water (removes heat from the body).	**1**	
9	**(e)**		They have a high surface area to volume (ratio). **Or** They have a less efficient/developed temperature regulation mechanism. **Or** They are less active (so generate less heat). **Or** They have less fat (for insulation). **Or** They cannot shiver (to generate heat). **Or** They cannot carry out voluntary actions/ communicate. **Any 2**	**2**	Do not accept myelination is not complete. Accept thermoreceptors/ hypothalamus is not fully developed.

Question			Expected Answer(s)	Max Mark	Additional Guidance
10	**(a)**		Name – dendrite. Function – receives impulses (from other nerve cells). **Or** Carries impulses into the cell body.	**1**	
10	**(b)**		1. (Impulse stimulates) vesicles to move to/ fuse with membrane. 2. Neurotransmitter released and/then diffuses/moves across gap/synapse. 3. Neurotransmitter attaches to receptors (on muscle). 4. Threshold of neurotransmitter must be achieved for muscle contraction. **Any two for 1 mark, any three for two marks.**	**2**	Accept acetylcholine for neurotransmitter. Accept description of threshold.
10	**(c)**		There are actin and myosin filaments present. **1 mark** Where they overlap a striped/striated appearance results. **1 mark**	**2**	Not looking for sliding filament theory.
11	**(a)**		Rod	**1**	
11	**(b)**		They are part of a convergent pathway **Or** They are in a pathway which links to a single neurone. **1 mark** Together they release enough neurotransmitter to reach threshold/ stimulate receptors (to trigger an impulse). **1 mark**	**2**	
11	**(c)**		Visual area/cerebrum/visual cortex	**1**	Accept visual association area. Not visual on its own.

Question			Expected Answer(s)	Max Mark	Additional Guidance
12	**(a)**		Organisation – related information is grouped together. **Or** Information is put into categories/headings. **1 mark** Elaboration – additional information is given (about each term). **Or** Meaningful information is given (about each term). **1 mark**	**2**	Not chunking. Not simply - put into groups. Not put information into a story/into context.
12	**(b)**		Short-term memory/STM has a limited capacity/span/only holds around 7 items of information.	**1**	Accept anything between 5 and 9 items.
12	**(c)**		NMDA.	**1**	Order of letters must be correct.
13	**(a)**		26 million/26 000 000	**1**	
13	**(b)**		0·6 million/600 000	**1**	
13	**(c)**		5·14/5·1/5	**1**	
13	**(d)**		The steepest part of the (HIV infected) line (was between 1993 and 1995).	**1**	Not - the greatest increase in rate occurs between 1993 and 1995. Answer must refer to the gradient of the line. Answer must indicate a comparison to other areas. So not it rises steeply between 1993 and 1995.
13	**(e)**		Awareness raising/education/advertising about HIV (transmission). **Or** Provision of condoms **Or** Provision of sterile needles.	**1**	Accept abstinence described in an educational context. Not contraception in general. Not quarantine.

Question			Expected Answer(s)	Max Mark	Additional Guidance
14	**(a)**	**(i)**	30 **Or** 26.67/26.7/27	**1**	
14	**(a)**	**(ii)**	Overfishing. **Or** Increased predation. **Or** (Imposed) quotas/catch restrictions/ legislation. **Or** Fewer fishing boats. **Or** Disease (killing cod). **Or** Less food for cod/increased competition. **Or** Increased pollution/toxic waste/sewage	**1**	Not - global warming Not – fertilisers Not – algal blooms Not – decrease in oxygen Not – pollution (on own)
14	**(b)**		3 : 2 : 1	**1**	
14	**(c)**		The percentage of cod caught remains about the same/increases while the total mass of cod caught falls.	**1**	
14	**(d)**		1. The krill population increases in number as there are less pouting (to eat them). **1 mark** 2. The copepod numbers decrease as krill eat more of them so the cod have less food. **Or** Cod will be competing with the krill for food/ copepods (which will lead to their population decreasing). **1 mark**	**2**	Mark with appropriate number where giving the point.

Section C

1A

(i) Events leading to ovulation

1	Pituitary gland secretes/produces FSH/LH.	**1**
2	FSH stimulates growth of <u>follicle</u> (in the ovary).	**1**
3	Follicle/ovary produces oestrogen.	**1**
4	Oestrogen stimulates/repairs the endometrium/uterus lining.	**1**
5	Oestrogen stimulates production of LH.	**1**
6	LH (surge) brings about ovulation/release of the egg.	**1**
7	<u>Rising/high levels</u> of oestrogen inhibit FSH production.	**1**
8	This is negative feedback.	**1**

Max 6

(ii) Events following ovulation

9	The follicle develops into the corpus luteum.	**1**
10	Corpus luteum secretes progesterone (and oestrogen).	**1**
11	Progesterone maintains/increases/thickens the endometrium/uterus lining.	**1**
12	Progesterone/oestrogen inhibits <u>FSH/LH</u> production. (*Point 8 may be awarded here if linked to Point 12*)	**1**
13	Progesterone/oestrogen levels decrease towards the end of the cycle.	**1**
14	This/corpus luteum degeneration triggers menstruation/breakdown of the endometrium	**1**

Max 4

Total 10

1B

(i) The conducting system of the heart

1	SAN/pacemaker is in the (wall of the) right atrium.	**1**
2	Impulses spread across the atria/cause the atria to contract/cause atrial systole.	**1**
3	(Impulses) reach/stimulate the atrioventricular node/AVN.	**1**
4	AVN found at junction of atria and ventricles.	**1**
5	Impulses from AVN carried by fibres/bundle of His/down the central wall of the heart/septum.	**1**
6	Impulses spread over the ventricles (through Purkinje fibres).	**1**
7	Ventricles contract/ventricular systole.	**1**
8	(This is followed by) relaxation/resting/diastolic phase/diastole.	**1**

Max 6

(ii) Nervous and hormonal control of the cardiac cycle

9	Medulla controls the cardiac cycle/is where impulses arise.	**1**
10	Autonomic nervous system (carries impulses to the heart).	**1**
11	Connects to sinoatrial node/SAN/pacemaker.	**1**
12	Sympathetic (nerve) speeds up heart rate.	**1**
13	Parasympathetic/vagus nerve slows down heart rate.	**1**
14	Adrenaline speeds up the heart rate.	**1**

Max 4

Total 10

2A

1	Plants take up/use CO_2 during photosynthesis.	**1**
2	Animals (gain carbon) eat plants/other animals.	**1**
3	CO_2 is released as a result of respiration.	**1**
4	All living things/plants and animals respire.	**1**
5	Decomposition/decay releases CO_2.	**1**
6	Carbon is stored in fossil fuels.	**1**
7	The increase in human population (is disrupting the carbon cycle).	**1**
8	Burning of fossil fuels or an example of a fossil fuel increases/releases CO_2 (in the atmosphere).	**1**
9	Deforestation (leads to CO_2).	**1**
10	Increase in CO_2 causes global warming/the greenhouse effect.	**1**
11	Methane contributes to global warming/is a greenhouse gas.	**1**
12	Methane production comes from cattle/livestock/paddy fields/waste/landfill sites.	**1**

Max 8

The coherence and relevance marks are only awarded when at least five marks have been scored from points 1 to 12 and the following criteria are met.

Relevance – A single short reference to an irrelevant point is not penalised but development of the point is penalised. However, two irrelevant points without development are penalised.
For example, mention of two or more of the following will lose this mark:

references to the nitrogen cycle/ozone/pesticides/fertilisers/desertification **1**

Coherence – Response should contain paragraphs/subheadings, have a logical sequence and be written in sentences (not bullet points). **1**

Note – After the candidate response in the paper write an R and a C and place a tick or cross beside each before totalling the marks for the question.

Total 10

2B

1	Plants take up nitrates/nitrogen (from the soil)	**1**
2	Animals (gain nitrogen when they) eat plants/other animals.	**1**
3	Nitrogen is used by organisms to make protein/amino acids.	**1**
4	Decomposition/decay returns nitrogen/ammonia/ammonium to the soil.	**1**
5	Nitrification/nitrifying bacteria produce nitrates.	**1**
6	Denitrification/denitrifying bacteria release nitrogen (into the atmosphere).	**1**
7	Nitrogen-fixing bacteria produce nitrates (from nitrogen gas).	**1**
8	The increase in the human population (is disrupting the nitrogen cycle).	**1**
9	Removal of crops reduces soil nitrogen/nitrates.	**1**
10	Using fertilisers adds nitrogen/nitrates (to the soil).	**1**
11	Fertilisers/sewage can be washed/leached into rivers/lochs.	**1**
12	This creates algal blooms/an increase in algae.	**1**
13	Lightning adds nitrates/nitrogen (to soil and water).	**1**
14	Drinking water can be contaminated by nitrates/nitrites.	**1**

Max 8

The coherence and relevance marks are only awarded when at least five marks have been scored from points 1 to 14 and the following criteria are met.

Relevance – A single short reference to an irrelevant point is not penalised but development of the point is penalised. However, two irrelevant points without development are penalised.
For example, mention of two or more of the following will lose this mark:

Carbon cycle/global warming/ozone **1**

Coherence – Response should contain paragraphs/subheadings, have a logical sequence and be written in sentences (not bullet points). **1**

Note – After the candidate response in the paper write an R and a C and place a tick or cross beside each before totalling the marks for the question.

Total 10

[END OF MARKING INSTRUCTIONS]